Appendix D
CALIFORNIA DEPARTMENT OF FORESTRY AND FIRE PROTECTION
Catalytic Converter Caused Fires

by

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Catalytic converters were first required on most California light-duty vehicles in the 1975 model year.

It was originally thought vehicle exhaust systems equipped with converters would run hotter and, thus, cause more fires. It was also felt that as vehicles aged or leaded gasoline was utilized in lieu of unleaded, converters would "go bad" and cause fires. Neither of the above-mentioned situations appear to be the primary reason for converter caused fires. The belief that converters would cause fires as the vehicles aged or with use of leaded gasoline does not seem to be the case. This Unit has not experienced any fires believed to be caused by a converter malfunction resulting from the age of the vehicle or use of leaded gasoline.

When converters were first installed, a number of vehicles experienced fires originating on the floorboards due to the heat given off by the converters. Heat shields have now been installed and fires rarely occur within the vehicle.

Ongoing incidents have been reported involving individuals driving onto dry grass and immediately causing a fire. This is due to the exhaust system coming into contact with the dry grass. However, non-converter equipped vehicles have also been known to cause fires when driven onto dry vegetation and making direct contact with the exhaust system. Fires caused by converter equipped vehicles have occurred instantaneously once the vehicle has come to a stop on dry grass. In several cases, occupants have exited the vehicle with flames appearing from underneath because the vegetation was already on fire. Whereas, when occupants exited a non-converter equipped vehicle, the smell of smoldering grass was often an indicator that a fire was about to occur. This would often give the occupants time to move the vehicle to a safe parking location and avoid a fire.

Catalytic converter melt down caused by a malfunction within the electronic ignition system is a source of ignition no one anticipated. This malfunction allows raw fuel to go directly into the exhaust system, with the converter becoming a combustion chamber. The converter then melts down and emits hot pieces from the tail pipe. It is estimated the converter melts at around 2400 to 2800 degrees F. It is apparent that age and maintenance of a vehicle have nothing to do with the malfunction. The malfunction is in the electronic ignition system, for which there are no tests to determine possible failure. A cause of electronic ignition malfunction is low voltage in the system. This can be due to a dead or near-dead battery or other problems within the electrical system.

Witnesses describe particles being emitted from the exhaust systems as "fusees being thrown out of the vehicle," or "a steady stream of fire coming out of the exhaust system." One witness saw his own GM converter fail. He reported seeing "sparks flying all over the place" in his rear view mirror.

In 1985, the CDF Shasta-Trinity Unit began a survey to track catalytic converter fires within the Unit. They also obtained further information from other CDF Units, along with USFS areas surrounding the Shasta-Trinity boundaries. From 1985 through the summer of 1996, there have been a total of 29 incidents

related to the meltdown of a catalytic converter. This has resulted in 104 fires burning 737 acres. There may have been additional fires, for which information was not received.

During the 1996 fire season, the Coast Cascade Region kept track of fires believed to have been caused by converters melting down. A total of 10 incidents resulting in 28 fires were reported throughout the region.

Vehicles identified as causing fires note less than 10,000 miles and as much as 100,000 miles. Public agency vehicles including CDF, USFS, and CHP, along with private agencies such as PG&E, have generated fires. These agencies typically have higher maintenance standards than any private citizen.

It would seem if a malfunction is causing the converter to melt down at 2400 to 2800 degrees F, the vehicle would soon stop running. For unknown reasons, this does not seem to be the case. The responsible vehicle has been identified less than 33% of the time. Whenever converter caused fires are suspected in the CDF Shasta-Trinity Unit, an effort is made to locate the responsible vehicle. For the most part, the vehicle has been located near the fires or not at all.

POSSIBLE SIGNS OF CATALYTIC CONVERTER MALFUNCTION:

- Vehicle runs very rough.
- May backfire.
- Vehicle seems to lose power.

Of concern: How far can a vehicle with a malfunctioning converter travel while spreading fire before it will stop?

Based upon the number of fires occurring within the Shasta-Trinity Unit, and the fact that only 33% of the responsible vehicles were located, it appears the malfunction may occur and then correct itself. Oftentimes, the malfunction will allow only one particle to escape the exhaust system causing 1 fire. At other times numerous particles are emitted resulting in multiple fires. At one point, 4 fires were spread over a 10-mile area and another time, 11 fires were spread over a 215-ft. area. The responsible vehicles were never located. In most cases, the fires have been within a one-mile stretch, with an average of 3 fires per incident.

- It should be noted that although there are only three recognizable fires, multiple separat fires could have burned together.

Survey results for the Coast/Cascade Region consisted of ten incidents with 28 separate fires. Four units reported fires caused by catalytic converter breakdowns:

- Shasta-Trinity (4) incidents
- Lassen-Modoc (3) incidents
- Butte (1) incident
- Lake-Napa-Sonoma (5) incidents

A 1984 Dodge Pickup and a 1992 GMC 1T van were identified in 2 of the 10 incidents. (See Chart 1.) There were 4 additional incidents where the converter came into direct contact with vegetation.

Most vehicles are equipped with one catalytic converter. GMC has now installed a second converter in their exhaust system. GMC vehicles have a pellet-type catalyst, which makes detecting them in an origin extremely difficult. Prior to this year, the muffler design on GMC vehicles enabled them to function similarly to a spark arrester. This muffler design may have prevented melted pellets from exiting the exhaust system. All converters are installed prior to the muffler. This undoubtedly restricts some particles from escaping and causing even more fires. GMC's second converter is installed after the muffler. Therefore, when a malfunction occurs, there is nothing to stop the pellets from exiting the exhaust system.

The survey does not reveal an overwhelming number of converter fires within the Region. However, it is the single incident consisting of an overwhelming number of fires which are spread over a large area and occurring at the same time, that will result in a destructive fire.

Can these converter caused fires be reduced or eliminated altogether?

We know vehicles will continue to be equipped with catalytic converters. We also know if people continue to park on dry grass which comes into contact with the converter, a fire will probably occur. However, if the particles were prevented from escaping the exhaust system (similar to a spark arrester) this cause could be eliminated or greatly reduced.

Are all fires related to catalytic converters being accounted for? Are fires being attributed to converters that were caused by other sources?

- Shasta-Trinity Unit survey: The majority of fires attributed to converters have been **confirmed** as converter fires, with the finding of converter pieces in or near the origins.
- Region survey: The majority of fires were assumed to be converter fires, with only 4 of the incidents listed as **confirmed** to be converter caused.

Converter pieces being emitted from the exhaust system of vehicles range from minute in size to pieces measuring 1" x 2". Pieces have not always been found in origins, but are often located on either side of the fire. The pieces are generally light gray in color. They blend readily with the existing roadside gravel. GM pellets are initially approximately the size of a BB. However, when subjected to extreme heat, they melt or burn down and can be ½ to ¼ of the original size.

IF YOU SUSPECT A FIRE OR FIRES HAVE BEEN CAUSED BY A CONVERTER MELTDOWN AND YOU CANNOT FIND THE CONVERTER PIECES IN THE ORIGIN AREA, WALK THE ROADWAY ON EITHER SIDE OF THE FIRE FOR AT LEAST 100 YDS IN BOTH DIRECTIONS.
Oftentimes, you will find converter pieces scattered in the roadway. You may also locate additional fires that have burned a small spot approximately 2" in diameter.
Vegetation along the roadway is the most limiting factor in how far a converter piece will travel. If the pieces are being emitted by a passenger vehicle, the exhaust system is normally within 18 inches of the roadway. In most areas of the state, grass along the roadway is taller than 18". Tall grass readily stops the converter pieces from traveling a great distance. In these instances, converter pieces are usually found within 5 feet of the roadway's limit line. Pieces have been found as far as 35 feet from the limit line if there is no grass to stop them.
Exhaust systems on pickups, 4-wheel drives, and motor homes are normally 2 feet or more above the roadway, which would lead you to expect to find the converter pieces farther off the roadway. Converter pieces have been known to cause fires on both sides of the roadway. At times, fires are directly across from each other and, at other times, they are spread out along the roadway. Pellets from a GM product were found 18 inches above the roadbed on an embankment. It seems the pellets are more inclined to bounce when discharged from the exhaust system.

In the survey conducted within the Shasta-Trinity Unit, road grades and curves do not seem to make a difference as to whether the vehicle discharges particles or not. In other exhaust-caused fires, it is often believed the vehicle is working under pressure, or that the driver has accelerated the engine, causing the particles to discharge. In converter-caused fires, acceleration of the engine has nothing to do with the malfunction causing the problem.

Fires have occurred in all types of terrain, including straight, flat uphill/downhill, and curves. The only common denominator: Drivers reported their vehicles as running rough, backfiring, or losing power. In one reported incident, a CHP vehicle caused a series of 3 fires. The officer stated his vehicle seemed to lose power to the point where he pulled to the side of the road and requested a tow.

CATALYTIC CONVERTER PIECES ARE NOT MAGNETIC. THE ONLY WAY TO DETECT THE PIECES IS BY VISUALLY LOCATING THEM. This is oftentimes difficult as they resemble gravel and blend with the surrounding terrain.

IF YOU SUSPECT CONVERTER CAUSED FIRES, USUALLY MORE THAN ONE, LOOK FOR A DISABLED VEHICLE IN CLOSE PROXIMITY OF THE FIRES.

Generally there is no negligence by an individual if the vehicle's converter has caused fires. Drivers often have no idea what the problem is. They may attempt to limp into the nearest service station, unknowingly causing fires along the way. **IF YOU DO LOCATE A SUSPECT VEHICLE, ENSURE THAT THE OWNER HAS THE VEHICLE CHECKED BY A MECHANIC.** You might need to talk to the mechanic yourself and advise that the converter may have melted down.

At times, it is believed the malfunction that caused the meltdown of the converter corrects itself, and may be operating correctly when checked by a mechanic. Correcting the problem does not mean it cannot happen again in the same vehicle. The above-mentioned CHP vehicle had a similar malfunction on 3 separate occasions during the life of the vehicle. However, with each subsequent malfunction, the officer was wiser and requested a tow.

CAUTION: IF YOU LOCATE A SUSPECT VEHICLE AND WISH TO OBSERVE THE DAMAGE TO THE CONVERTER WHEN THE VEHICLE IS IN THE SHOP, DO NOT LOOK DOWN THE EXHAUST PIPE WHILE THE MECHANIC IS ATTEMPTING TO DISCONNECT IT. The cause of the malfunction is raw fuel escaping directly into the exhaust system. Some of this raw fuel may still be in the converter area. When the mechanic uses a torch to loosen the exhaust piping, ignition may occur and shoot a flame out the back end of the exhaust pipe.

As we continue to travel down the roads, we will likely experience fires from converters. At some point, a fire started by a converter may be responsible for destroying thousands of acres, burning homes, and possible deaths. A Public Fire Agency's vehicle could easily be the cause!!!!!

Attachments:

(1) Catalytic Converter Fires - COAST/CASCADE REGION

(2) Catalytic Converter Fires - SHASTA/TRINITY UNIT

Appendix D
Attachment 1

CALIFORNIA DEPARTMENT OF FORESTRY AND FIRE PROTECTION

COAST/CASCADE REGION
1996

UNIT	Number of Fires per Incident	Make of Vehicle	Distance from First to Last Fire	Origin Distance from Limit Line (Feet)	Cause K/L
SHU	4	Unknown	200 feet	3 - 10	L
	5	Unknown	400 feet	1 - 15	K
	4	Unknown	5.1 miles	1 - 10	L
	6	'92 GMC 1 Ton Van	825 feet	1 - 3	K
BTU	2	'84 Dodge PU	500 feet	1	K
LMU	1	Unknown			L
	1	Unknown		<1	L
	1	Unknown		<1	L
LNU	3	Unknown	20 feet	10	K
	1	Unknown			L

The above fires were the result of meltdown of the catalytic converter. An additional 4 fires were reported (3 LNU and 1 SHU) where the converter came into direct contact with the vegetation.

Appendix D
Attachment 2

SHASTA-TRINITY UNIT

Year	Number of Fires per Incident	Acreage	Make of Vehicle	Distance from First to Last Fire	Origin Distance from Limit Line (Feet)	Cause K/L
1985	6	610	Unknown	2 miles	9 - 14	K
	5	.5	Unknown	300 feet		K
1986	3	spot	'84 Dodge PU	1 mile		K
	3	spots	'85 Dodge PU	.5 mile	6.5 - 11	K
	3	spots	'85 Dodge PU	.3 mile		K
	11*	spots	Unknown	215 feet	10	K
1987	5	1	Unknown	.3 mile	5	K
1988	3	spots	Dodge PU			K
	5	spots	Unknown	100 feet	2 - 5	K
1989	2**	spots	Unknown	100 feet	6	K
	1	spot	Unknown			K
	5	85	Unknown	1 mile	8	K
1990	7	spots	'78 Ford SU	.25 mile	2 - 35	K
1991	1	spot	Unknown			K
1992	4	.5	Unknown	10 miles	2.5 - 4	K
	2	20	Unknown	.2 miles	5	K
1993	2***	spot	'83 Chevy			K
	2	.5	4x4 Unknown	70 feet	5	L
	4	spots	Unknown	200 feet	5	K
	1	2	'76 Gremlin			K

Year	Number of Fires per Incident	Acreage	Make of Vehicle	Distance from First to Last Fire	Origin Distance from Limit Line (Feet)	Cause K/L
1994	5	spots	Unknown	400 feet	8	K
	1	spot	Dolphin Motor Home		5	K
	2	spots	Unknown	50 feet	5	L
1995	1	spot	'91 Ford PU		6	K
	3	1	Unknown	100 feet	5	K
1996	4	1	Unknown	5.1 miles		L
	3	5	Unknown	200 feet		L
	4	1	Unknown	300 feet	15	K
	6	10	'92 GMC 1 Ton Van	825 feet	1-3	K

All of the fires occurred within the CDF Shasta-Trinity Unit unless otherwise noted. *USFS, Lake Almanor District, ***One was within Redding Fire Department and the other was within CDF jurisdiction. Fire Causes K/L, K=Known, L=Logical.

These fires all occurred due to the meltdown of the converter. Fires caused by catalytic converter equipped vehicles which caused fires when in direct contact with the vegetation are not listed.